

amendments, while Attachment B is a clean copy of the amended claim.

REMARKS

Upon entry of this amendment, claims 1-10 are pending in the application. Claim 1 is an independent claim drawn to a method for cooling a seal located in a wall of a chamber, with claims 2-5 depending therefrom, while claim 6 is an independent claim drawn to an apparatus for cooling a seal, with claims 7-10 depending therefrom. Applicants submit that the amendments to the claims do not add new matter within the meaning of 35 U.S.C. §132 since the amendments to claim 2 provide proper antecedent basis for the limitations found therein.

Claims 2-3 stand rejected as being indefinite. Claims 1-10 stand rejected as being anticipated by Zimron et al. Further, claims 1-3 and 6-8 stand rejected as being obvious over Glaser et al. in view of Maier.

1. Rejection of Claims 2-3 Under
35 U.S.C. §112, Second Paragraph

Claims 2-3 stand rejected under 35 U.S.C. 112, second

paragraph as being indefinite for the reasons set forth in the Office Action.

RESPONSE

Applicants respectfully traverse this rejection and request reconsideration and withdrawal thereof.

Applicants respectfully submit that the amendments to claim 2 overcome this rejection, rendering the rejection moot. Applicants have amended claim 2 to provide proper antecedent basis for the labyrinth as claimed in line 4 of the claim. In particular, Applicants have replaced "a labyrinth" with "said labyrinth," making it clear that the labyrinth is the same as claimed in claim 1. Thus, Applicants have overcome this rejection.

Applicants respectfully request reconsideration and withdrawal of the rejection thereof as being indefinite.

2. Rejection of Claims 1-10 Under 35 U.S.C. 102(b)

Claims 1-10 stand rejected under 35 U.S.C. 102(b) as being anticipated by Zimron et al. (U.S. Patent No. 5,743,094) for the reasons set forth in the Office Action.

RESPONSE

Applicant respectfully traverses this rejection and

respectfully requests reconsideration and withdrawal thereof.

To establish an anticipation rejection, every claimed element must be found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 814 F2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); See also, MPEP § 2131. Applicant respectfully submits that the Examiner has not met this burden.

Claim 1 is drawn to a method for cooling a seal located in a wall of a chamber and through which a movable shaft passes, the seal being heated by hot pressurized vapor that leaks through a labyrinth into the chamber and internal friction. The method comprises the steps of (a) providing a chamber in which the seal is located and into which the hot pressurized vapor leaks; (b) injecting cool liquid into the chamber in which the seal is located; and (c) cooling **and condensing** the hot pressurized vapor in the chamber, thus cooling the seal and reducing the pressure in the chamber. Likewise, claim 6 is drawn to an apparatus for cooling a seal located in a wall of a chamber and through which a movable shaft passes. The seal is heated by hot pressurized vapor that leaks through the seal into the chamber and internal friction. The apparatus comprises (a) a chamber in which the seal is located and into which leaks the hot pressurized vapor; and (b) means for

injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal. The remaining claims depend from either claim 1 or claim 6 and, therefore, contain all of the limitations found in the independent claims.

Thus, in order for Zimron et al. to anticipate claims 1 and 6 (and the claims that depend therefrom), Zimron et al. must disclose all of the limitations set forth above. In particular, Zimron et al. must disclose **the condensation of the hot pressurized vapor in the chamber**. Applicants respectfully submit that Zimron et al. fail to do so, and therefore do not anticipate the claims.

Zimron et al. disclose a method of and apparatus for cooling a seal for machinery. The apparatus contains a seal heated by hot pressurized vapor and cooled by providing a chamber in which the seal is located and for containing vapor that leaks thereinto. The pressure in the chamber is reduced by connecting it to a source of low pressure; and liquid is supplied to the chamber at a pressure above the reduced pressure of the chamber and at a temperature below the temperature of vapor leaking into the chamber. The liquid is introduced into the chamber as droplets for contacting vapor that leaks thereinto, thereby cooling the vapor and thus cooling the seal. The flow rate of the liquid is adjustable in

accordance with the temperature of the liquid in the chamber.

In particular, Zimron et al. disclose (col. 4, lines 21-42) that:

[c]hamber 32 is connected by connection 50 to a source of low pressure, and particularly, to the condenser of the power plant with which turbine 14A is associated. This chamber is also connected via connection 52 to the output of the cycle pump as shown in FIG. 1. **Pressurized condensate at the temperature substantially of the condenser is supplied via connection 52 to spray head nozzles 54 that open to the interior of chamber 32, and relatively cold liquid working fluid is sprayed onto cylindrical shield 56 further converting the liquid into fine droplets that form a mist inside chamber 32. This mist interacts with hot vapor leakage B thereby cooling this hot vapor by means of direct contact heat transfer of heat in the vapor to liquid contained in the droplets and partial evaporation of the liquid in the droplets and thus forming a mixture of working fluid that flows into sump 32' from which the mixture is vented and drained by connection 50 into the condenser.** As a result, the temperature of mechanical seal 46 can be maintained at a desired temperature by regulating the amount of liquid supplied to connection 52. Shield 56 shields mechanical seal 46 from direct contact with cool liquid from the condenser and thus protects the seal against thermal shock. (Emphasis added).

As can be seen, Zimron et al. disclose that the mixture is **vented and drained by connection 50 into the condenser**, where condensation takes place. Thus, Applicants respectfully submit that Zimron et al. fail to disclose the condensation of the hot pressurized vapor **in the chamber**, as is claimed in the present independent claims (and also the dependent claims). Since Zimron

et al. fail to disclose the condensation of the hot pressurized vapor in the chamber, Zimron et al. fail to teach each of the claimed limitations, and therefore do not anticipate the claims

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-10 as being anticipated by Zimron et al.

3. Rejection of Claims 1-3 and 6-8 Under 35 U.S.C. 103(a)

Claims 1-3 and 6-8 stand rejected under 35 U.S.C. 103(a) as being obvious over Glaser et al. (U.S. Patent No. 4,786,238) in view of Maier (U.S. Patent No. 5,156,523) for the reasons set forth in the Office Action.

RESPONSE

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The references of record, Glaser et al. and Maier, do not teach or suggest Applicants' inventive subject matter as a whole, as recited in claims 1-3 and 6-8. Further, there is no teaching or suggestion in this reference which would lead the ordinary skilled artisan to modify the reference to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

A. The present inventive subject matter

Claim 1 is drawn to a method for cooling a seal located in a wall of a chamber and through which a movable shaft passes, the seal being heated by hot pressurized vapor that leaks through a labyrinth into the chamber and internal friction. The method comprises the steps of (a) providing a chamber in which the seal is located and into which the hot pressurized vapor leaks; (b) injecting cool liquid into the chamber in which the seal is located; and (c) cooling **and condensing** the hot pressurized vapor in the chamber, thus cooling the seal and reducing the pressure in the chamber. Likewise, claim 6 is drawn to an apparatus for cooling a seal located in a wall of a chamber and through which a movable shaft passes. The seal is heated by hot pressurized vapor that leaks through the seal into the chamber and internal friction. The apparatus comprises (a) a chamber in which the seal is located and into which leaks the hot pressurized vapor; and (b) means for injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal.

The remaining claims depend from either claim 1 or claim 6 and, therefore, contain all of the limitations found in the independent claims.

B. The References

Glaser et al. (U.S. Patent No. 4,786,238) disclose an apparatus for cooling and thermally isolating turbo-compressor foil bearings. The bearing journal includes a hollow shaft through which gas is positively circulated to cool the shaft. Pressurized gas may be introduced from the compressor into the interior of the hollow shaft and, after traversing the shaft, returned to the compressor.

Meanwhile, Maier (U.S. Patent No. 5,156,523) discloses a coupling for feeding a heat-exchange fluid between a stationary supply and a rotating body. The coupling comprises a tubular rotor shaft fixed to the rotating body and rotatable about and centered on an axis and a nonrotatable housing fixed stationarily adjacent and surrounding the body.

C. Differences between claimed invention and references

The differences between applicants' inventive subject matter and the cited references are readily apparent from their independent and distinct disclosures and claims. Claims 1 and 6 each contain the limitation of injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal (and

reducing the pressure in the chamber). These are important limitations within the claims and must be shown by the combination of references in order for the Examiner to establish a prima facie case of obviousness. Applicants respectfully submit that the Examiner has failed to show these limitations within the references.

The Glaser et al. patent is directed to a thermal isolation system for turbochargers and like machines. In column 3, lines 9-21, Glaser et al. indicate that "in brief, arrangements in accordance with the present invention provide improved means for both cooling pliant film bearings in turbomachinery or the like during operation and protecting such bearings by restricting heat transfer from a hot source, such as a turbine wheel, after shutdown of the machinery. Some of the disclosed arrangements also feature structures for protecting the bearings from contamination by combustion products from the turbine. In accordance with one particular aspect of the invention, these various embodiments provide for cooling a hollow bearing shaft **by directing cooling air flow** through the shaft inside the bearing." (Emphasis added). Furthermore, Glaser et al. emphasize that the invention is related to "gas lubricated bearings associated with the rotating shafts of gas turbines and turbo-compressors." (Col. 1, lines 10-12).

Applicants respectfully submit, however, that Glaser et al. are silent with respect to the presently claimed limitations of injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal. Nowhere within the Glaser et al. patent is disclosed cooling and condensing hot pressurized vapor by injecting liquid into a chamber containing the same. Since Glaser et al. fail to disclose these limitations, the Examiner has failed to make a prima facie case of obviousness against the Glaser et al. patent when taken alone.

The Examiner relies on the Maier patent to cure the deficiencies of the Glaser et al. patent. However, Applicants respectfully submit that Maier also fails to disclose the critical limitations.

Maier discloses a coupling for feeding a heat-exchange fluid between a stationary supply and a rotating body. The coupling comprises a tubular rotor shaft fixed to the rotating body and rotatable about and centered on an axis and a nonrotatable housing fixed stationarily adjacent and surrounding the body. (Col. 1, lines 50-55). In other words, Maier discloses connecting a rotating body to a heat exchange media supply or to "a coupling for feeding a heat exchange medium to a rotating body." (Col. 1,

lines6-7). Further, amongst the objects of the invention, Maier lists providing an improved coupling for connecting a rotating body to a source of a heat-exchange medium to be supplied to the body.

Maier is silent, however, with respect to the teaching of injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal, as is claimed in the present claims. Thus, much like Glaser et al., Maier does not disclose the claimed limitations as found in the present claims. Since Maier fails to disclose these limitations, the Examiner has failed to make a prima facie case of obviousness against the Maier patent when taken alone.

Applicants respectfully submit that the Examiner has failed to make a prima facie case of obviousness against the claims based on the combination of the Glaser et al. and Maier patents. Assuming *arguendo* that the references were combined in an attempt to achieve the presently claimed subject matter, the resulting product would still not teach the present claims. The product of the combined references would not include the limitation of injecting liquid into the chamber in which the seal is located such that the hot pressurized vapor is cooled **and condenses** in the chamber, thereby cooling the seal since neither reference teaches these limitations.

Therefore, the combination of the references still will not achieve the present claims. As such, Applicants respectfully submit that the claims are not obvious over the combination of the references.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-3 and 6-8 as being obvious over the Glaser et al. patent in view of the Maier patent.

CONCLUSION

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

If the Examiner has any questions or comments regarding this matter, he is welcomed to contact the undersigned attorney at the below-listed number and address.

Respectfully submitted,
NATH & ASSOCIATES

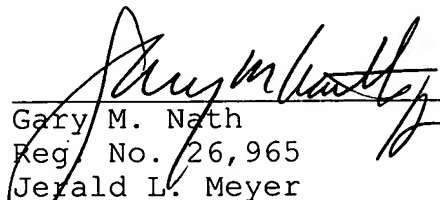
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In re Application of:

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Group Art Unit: 3748

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Examiner: H. Nguyen

For: **METHOD OF AND APPARATUS FOR COOLING A SEAL FOR
MACHINERY**

ATTACHMENT A - MARKED-UP COPY OF CLAIM AMENDMENTS

Please amend claim 2 as follows:

2. (Amended) A method according to claim 1 comprising the step of providing a pressure chamber for containing the hot pressurized vapor within which a turbine wheel is mounted on said shaft, and vapor least past [a] said labyrinth mounted on the shaft between the turbine wheel and the seal.

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